Project Proposal:

USDA State & Private Forestry Grant

Applicants: **Florida Division of Forestry**

Project: **Effectiveness of Silviculture Best Management Practices for Forest Fertilization in Operational Silviculture and Pine Straw Production to Protect Water Quality**

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Project Proposal Abstract: While fertilization for operational silviculture is a continuing practice, pine straw production is an expanding industry in the south, with estimated annual revenues in excess of 79 million dollars in Florida alone. Because of these high revenues, some pine straw producers are reportedly applying fertilizer at luxury consumption rates. This relatively new practice includes an unquantified land area and represents a significant, potential threat to surface and water quality throughout the South. Monitoring and demonstration sites will be established to evaluate the effectiveness of current forest fertilization BMPs for silvicultural and pine straw operations. A principal objective will be to estimate the magnitude and geographic extent of pine straw production, the amount, type and rates of fertilizer applied in this practice, and to provide additional BMPs (if necessary), training and education programs for all users of forest fertilization.

Partnering Agencies and Groups: U.S. Environmental Protection Agency, Florida Department of Environmental Protection, University of Florida, Florida Forestry Association, Rayonier Corporation, Plum Creek Timber Company, Foley Timber and Land Company, Putnal Pine Straw, and Coastal Lumber Company.

Project Location: Florida

Expected Completion Quarter: Quarter 4, 2010

Total Federal Funding Request: **$450,000** (FY '08 - $150,000, FY '09 - $150,000, FY '10 - $150,000)

Total Proposal Budget (Including Matching Funds): $675,000; Leveraged external funding $1,008,950

Cost Category	REQUESTED	MATCH	LEVERAGED
Personnel	431,532	200,000	
Materials & Supplies			
Equipment			
Travel	18,467	25,000	
Contracts			1,008,950
Printing			
Administration			
TOTALS	**$450,000**	**$225,000**	**$1,008,950**

Project Description:

Project Description: Fertilizers are commonly applied in southern pine stands at establishment or periodically during the rotation to increase financial returns by enhancing growth rates and shortening the time to harvest. In recent years, sale of pine straw has grown to be as economically important as pine pulpwood in some areas of Florida and the south, and mid-rotation fertilization as a means of enhancing pine straw production is reportedly commonplace - specifically, repeated applications of mineral fertilizers, such as diammonium phosphate, ammonium nitrate, and urea. Nutrient use efficiencies for fertilization of southern pines are typically about 50%. Nitrogen and phosphorus removals from pine straw raking are largely a function of the proportion of the harvestable area, site, and stand conditions; but for a single raking range from 5-60 lb N and 0.5-5 lb P per acre. The values for pine straw raking reportedly range from 75 to more than 100 dollars per acre, possibly enabling growers to fertilize at rates above luxury consumption.

Existing fertilization BMP's around the south generally recommend developing a nutrient management plan based on desired timber yields. Current Florida BMP's also provide the following periodic limits to N and P fertilization amounts:

For elemental nitrogen:

- No more than 1000 lbs/acre over any 20-year period.
- No more than 250 lbs/acre for any 3-year period
- No more than 80 lbs/acre during the first 2-years of newly established plantations

For elemental phosphorus:

- No more than 250 lbs/acre over any 20-year period
- No more than 80 lbs/acre for any 3-year period

This project proposes six monitoring and demonstration sites in locations with contrasting leaching and runoff potential. Two of the monitoring and demonstration sites will be located in mid-rotation slash pine stands and will examine the impact of operational fertilization using a range of fertilizer rates, where pine straw raking will occur. The impact of pine straw removal on leaching potential, surface water quality, stand growth, and pine straw yields will be examined for fertilized and unfertilized conditions. The other four monitoring and demonstration sites will be adjacent to perennial streams, and will examine surface water quality, in addition to nutrient leaching, following typical operational fertilization for silviculture. Two of these four sites will also be located in mid-rotation slash pine and the other two will be located in newly established slash pine plantations. All fertilization applications will be in compliance with Florida's forest fertilization BMP's, and consistent with BMPs across the South.

Water quality monitoring will utilize a combination of automated samplers, suction lysimeters, and groundwater wells. Replicate stream bioassessments will also be conducted and periphyton community structure, periphyton in-stream abundance will be assessed, using a before-after-control-impact study design.

New BMPs for forest fertilization and pine straw raking will be developed along with educational materials, based on conclusions from the project. Following the project, training sessions will be organized conducted for loggers, landowners and pine straw producers in a multi-state format. Any new BMPs will be monitored for implementation and effectiveness as part of the state's ongoing program.

Evaluation Criteria Discussion:

National and Regional Relevance - This project has regional as well as national significance as nutrient enrichment of surface and groundwater is a universal and growing problem, even at a global scale. For example, EPA region 4 (Atlanta) has identified over 4,600 impaired waters, and 57% of those are impaired due to nutrient enrichment – making this a high priority issue. Likewise, over 200,000 tons of fertilizer is applied on approximately 1.6 million acres of pine plantations per year in the southeastern U.S. alone. In Florida the state's Department of Environmental Protection has identified nutrients as the number one water quality problem, both for ground and surface water. While silviculture BMPs in Florida and the south generally address this issue, little verification of BMP effectiveness for forest fertilization has taken place. Hence, questions remain about forest-water quality and the larger questions related to forestry's contribution to the nutrient enrichment of the nations waters. In addition, the issue of fertilization of planted pines for the purpose of improving pine straw production (for raking), is relatively new and unquantified. However, with changing markets for wood products, pine straw raking has become as financially lucrative as early pulpwood harvests. Consequently, this is now a significant forest use throughout the south, with potential for continued growth. The "pine straw fertilization" issue also raises questions about forest health, as the frequency and depth of raking may introduce forest pathogens, and may adversely effect tree growth and yield.

Meaningful Scale - Although this project will be conducted in the state of Florida, the results will be universally applicable, especially to states in the gulf coastal plain. Forest fertilization and pine straw raking are common throughout most of the southeastern U.S. and may be on the increase in some areas. In addition, a number of industrial landowners are openly discussing biomass production from trees and the plan for significantly increasing the frequency and rates of forest fertilization regimes.

Collaboration - This project involves collaboration between a diverse group of stakeholders, including private forest landowners, regulatory agencies, and university researchers.